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Nature of Attention

N. N. SEN GUPTA

"The description and explanation of the facts comprised under the familiar term attention," says Külpe, "constitute one of the most formidable difficulties which the psychologist encounters in the whole course of his enquiry." Numerous experimental studies, observation of behaviour and analysis of concepts have not done much in resolving the difficulties to which Külpe refers. It is generally admitted that attention has a physical as well as a mental phase. The physical phase consists of (*i*) the adjustment of sense-organs, (*ii*) a general adjustment of the body for the reception of the impression [1] (*iii*) and in some instances, the prepared condition of a particular set of muscles for action. The problem in regard to these processes is whether they are essential constituents of attention or are mere accompaniments.[2] Again some of these physical functions are augmented beyond their normal conditions while others are diminished in the state of attention. There is facilitation in some of the instances and inhibition in others. A further problem, thus, arises: which of these is primary to attention? The issues concerning the bodily changes have yet to be settled; but the uncertainty is greater in the sphere of subjective changes which occur in attention. The conceptions of Range and Degree and the phenomenon of fluctuation are questions about which the last word has yet to be said.[3] And there is hardly any satisfac-

tory definition of the change that a mental state undergoes when it is subjected to attention.

Figures of speech which carry numerous suggestions have often been employed for describing the attentional consciousness. Thus a well-known text-book characterises attention as "preparatory selective, mobile and highly conscious."[4] Descriptions of this type serve admirably to stimulate interest in the phenomenon in question; they fail however, to form a definite conception which may be the starting point of a scientific enquiry. Formal definitions of attention have scarcely been more useful. For the casual observer as also for some psychologists, to attend is to exert a mental effort by virtue of which a particular experience is invested with some kind of pre-eminence or importance.[5] The experience becomes the initial phase of new mental events and develops its meaning. In the same way, Ribot speaks of attention as a process which arises from a tendency of consciousness to attain unity or fixity.[6] Ebbinghaus likewise describes the attentional state as one in which there is a narrowing or limitation of consciousness, just as in association there is the opposite tendency to elaboration or expansion.[7] In these cases, attention is defined in terms of what happens in the total field of consciousness which is subjected to attention. The gain in meaning, the tendency to fixity and unity and the phenomenon of narrowing, run an appreciable temporal course in their development and are accompanied by a variety of changes in the contents of consciousness. A description of the field with all its complexity may give a good picture of the attention process; it does not necessarily reveal the essential features. At the same time, a theory in terms of the whole field lays itself open to the criticism that attention is a concept of indefinite potentiality.[8] For, all the changes in the field may be attributed to attention. An alternative method of approaching the question is to define attention in terms of the attributes of the initial experience with which the attentional

phenomena set in. Thus, the essential feature of attention has been conceived as an increase in intensity. The hypothesis, however, has failed because it is palpably incompatible with facts. Another attribute which has been selected for this purpose, is that of clearness. The experience attended to is supposed to gain in clearness, or rather, attention, subjectively viewed, consists in an increase in the clearness of experiences.[9] The notion of clearness has probably been suggested by philosophic tradition in which it was for a long time the usual criterion of validity. For this reason, the attribute was supposed to belong principally to ideas. Sensation possesses it by virtue of its place as a constituent of the idea. Taken apart from ideas, sensations possess only quality and intensity.[10] Titchener, however, holds that clearness is essentially an attribute of sensations and suggests that attention develops out of this elementary clearness-attribute just as space perception develops from the elementary extensity-attribute.[11] These theories have for some years found wider acceptance, so that attention is defined to-day principally in terms of clearness.[11a]

The hypothesis owes its success to the support that it gets from introspection. The object attended to does not seem to change in quality or intensity, and yet it stands apart from the rest of the conscious field. This isolation or pre-eminence is what clearness connotes. But, clearness, unlike other attributes of conscious states, bears no specific correlation with the stimulus and the peripheral conditions. This is a fact which has stood in the way of any direct estimation of the attention process. Thus, we have no adequate means of comparing the attention of an individual at different times, nor that of several individuals.[12] The same fact has made it necessary to seek explanation of clearness in terms of psychic and cerebral processes of considerable complexity. G. E. Müller has suggested as its physiological correlate a process of centro-sensory reinforcement; Wundt on the other hand ascribes the

fact to inhibition. Münsterberg would explain it as a consequence of openness of the afferent channels which correspond to a sensory stimulation.[13] Other factors such as 'interest,' selective arrangement, etc., have similarly been proposed as explanations of subjective clearness.[14] The concept of clearness therefore has been more of a problem than a solution of the difficulties which the psychologist has to face in connection with the phenomenon of attention.

Again, clearness which belongs to sensations and that which pertains to ideas and meanings are not of the same order. The former has been called 'attributive clearness' and the latter cognitive clearness.[15] The two types of clearness may vary independently, as Dallenbach shows. An impression may be 'attributively' clear but cognitively unclear and *vice versa*.[16] Further, attributive clearness is generally supposed to possess only two levels; cognitive clearness may be arranged into a number of stages. Britz has found nine different degrees; Dallenbach has discovered no less than seventeen.[17] It is therefore difficult to explain one kind of clearness in terms of another. Wundt maintains, as has already been mentioned, that the elementary states possess clearness by virtue of their rôle as constituents of ideas. The latter however possess the kind of clearness which can be regarded as cognitive. Hence, it is not possible to hold that sensory clearness is derived from this latter. Nor is it possible for the same reason, to account for the clearness of ideas in terms of attributive clearness. It may be necessary, therefore, to assume two different sets of psychophysical conditions for the explanation of the two orders of clearness. It is apparent that the definition of the subjective condition of attention as a state of clearness does not lead us very far.

It is well to point out certain other consequences of the clearness theory. The Gestalt school has urged that the theory involves the assumption of unnoticed sense-perceptions. The obscure impression which is unperceived at first,

gains in clearness when attended to. This is a view of questionable validity. For, each perception is a configuration. When the unnoticed comes to notice, a new configuration has appeared.[18] Again the attribute of clearness is said to differ from other attributes in a very important aspect. Intensity or duration changes gradually through intermediate stages. Clearness abraptly drops from the maximal to the minimal.[19] Yet this supposition cannot be strictly maintained. Titchener says that the upper level is not to be represented by a plane surface ; it shows ' creases ' and ' wrinkles.' To all accounts, the lower level, too, may exhibit the same characteristics. Further, the distance of the two levels is by no means constant.[20] Hence, the transition from the one to the other is manifestly gradual.

Finally, if we appeal to the characteristics of the attentional experience as revealed by introspection, we are by no means certain that clearness is the essential feature. Thus according to MacDougall, though clearness and intensity are attendant phenomena, the essential factor in attention are " Lebhaftigkiet " and " Eindringlichkeit," which he translates as "activity" and " power of penetration."[21] If we take stock of the whole situation it seems that the concept of clearness is not sufficiently well-formulated to serve the needs of a theory of attention. It has not been successfully distinguished from other similar conceptions. It has yet to be correlated with a plausible physiological process ; and it has not been accepted as a criterion of attention with sufficient unanimity.

It may be profitable to seek a definition of the subjective conditions of attention in terms of the remaining attribute of psychic states, namely, their duration. The notion of duration and perseverance seems to be implied in many of the views of attention that we have referred to. " Attention " says Sully, " secures a certain persistence in the sensation or idea." The essential feature of attention seems to be for

him a sustenance of the object in consciousness;[22] Sully, however, insists upon the ' detention ' or arrest of the mental state so that it could be better observed. Such a notion is certainly untenable, as no state remains unchanged for any length of time. Associations and meanings connected with the state appear in consciousness and bring in their wake a host of others. Hence Stout remarks that when attention is directed to a train of thoughts there is a progressive determination of the central topic and the persistent thought of this topic guides and controls the whole process.[23] The same idea seems to underlie Shand's statement that " attention tends universally to render the idea or sensation attended to more active, evoking such fusion and association as renders further understanding of the subject possible."[24] There is, thus, a definite conception that attention leads to the persistence of sense impression or their central correlates, the images, and of their associations. The conception of attention as a state of perseverance therefore is not a new theory in Psychology.

When attention is directed to a sensory stimulus, a noticeable effect is that the sense-impression persists in consciousness. If the stimuli be removed when the attentional state continues, the sense-perception is replaced by images and ideas connected with the perception. A disturbance of attention, on the other hand, means an intermission in the series of impressions and ideas. We may think of distracted attention, therefore, as one in which the conscious states are of a short duration and are intermittant in character. In the higher degree of attention or concentrated attention, the mental states are of a longer duration and are continuous in character. In estimating duration and continuity, we should take cognizance not only of a particular sensory and imaginal state but also of states integrally connected with them. If mental states other than those that are intimately related to the initial state, arise, attention is said to change its direction. When the perseveration of a state is brought about by

subjective conditions, emotion, a specific aufgabe, etc., attention is said to be voluntary. When the stimulus, by virtue of any of its properties induces the perseverance of the correlated mental state attention is said to be involuntary. The physical processes in attention serve to bring about the continuance of the subjective states. They maintain the organic balance so that a particular mental state may have the best chance to continue. We may thus define attention as a process of organic adjustment—peripheral and central, which secures the perseveration of experiences.

Such a view of attention is suggested by a large number of facts some of which may be surveyed here. In the first place, some of the factors which determine the persistence of experiences also serve to induce attention. Thus, repetition and intensity of stimuli are determinants, both of attention and of perseveration. Primacy is another condition which favours both the functions. In the same way emotional tone, meaning and association secure persistence as well as attentional adjustment. As a matter of fact, the greatest influence of attention is said to be on the memory-process. This is naturally to be expected, for both rest upon the same basic fact of perseveration.

Secondly, some of the experiments on attention are largely tests of perseveration of impressions. The taschistoscopic experiments are very largely tests of persistence of impressions; for, the number of objects apprehended is estimated in terms of those that can be reproduced. The experiment on fluctuation of visual attention with the help of Masson's disc is actually one that demonstrates the perseveration of a liminal or nearly liminal impression. The same view may be taken of any other usual experiment on the fluctuation of attention.

Thirdly, the data of attentional experiments can be best explained in certain cases in terms of perseveration. An object once attended to can be perceived even when the circumstances

are so altered as to render such perception difficult. Thus, the upward course of a fire balloon can be traced to a point at which it would be otherwise invisible. This 'inertia of attention' can readily be explained as an instance of perseveration of experience. The law of prior entry may similarly be interpreted in terms of perseveration. In the experiment with the complication pendulum the observer is predisposed to refer the bell to a region of the dial which narrows down with practice. When the time for the bell to ring comes, "the sound is apperceived, rises to maximal clearness in minimum time; and the result is that the scale marks which the pointer has traversed before the hammer struck, are themselves apperceived with the objectively later complicating stimulus.[25] The observed effect is, thus, due to the perseveration of the visual image of a particular region of the scale for which the eye is involuntarily adjusted.

Fourthly, there are certain points of correspondence between the facts of perseveration and those of attention. The range of attention and the range of memory both possess the same numerical values. Both of these are tested in terms of perseveration. Again, prolonged attention leads to adaptation; perseveration of impressions too produces the same effect. Hypertrophy of attention, as Ribot employs the term, indicates nothing more than a persistence of a certain experience. In the same way, impairment of the capacity of attention means a decrease in the duration of impressions attended to. The change in the perspectives of the Mach's Berk Illusion and Staircase Illusion are often attributed to oscillation of attention. In these cases, there is no question of relative clearness of the perspectives; one simply disappears when the other appears. Thus, oscillation of attention consists in the fact that each of the figures persists for a time and yields its place to the other.

The perseveration hypothesis possesses certain advantages over the other theories of attention. The clearness theory and

the mental activity theory fail to attach adequate importance to the properties of the stimulus which are correlated with the subjective changes characteristic of attention. The stimulus is merely an indirect condition for clearness or mental activity which arises directly through the operation of psychic and physiological processes such as apperception or centro-sensory reinforcement. But the dependence of attention upon quality, intensity, time-relation, etc., of the stimulus are facts which are well-established. The perseveration theory enables us to relate the subjective process in attention both with the stimulus-factors and with the central factors in a direct way.

Secondly, the clearness theory involves the question of relation between sensory clearness and clearness of complex mental states. In the same way, the problem of cognitive and attributive clearness inevitably arises. The perseveration theory avoids all these difficulties. There is only one order of persistence which serves to define attention.

Thirdly, the questions of attentional attitude and intellectual attention cannot be adequately explained in terms of the clearness theory. When a person tries to recall an incident or to solve a problem, the end-product often appears all on a sudden. The state of effort and groping is so obscure that its character cannot be properly reported.[26] Yet the condition in which these obscure processes occur, is one of maximal attention. Attentional attitude, as an *Einstellung*, possesses a perseveration value, although the existence of clearness in such cases may be a matter of doubt. In the same way, we are rarely able to observe and to report the stages and the progress of a thought in which we may be engrossed. The thought-process appears in the form *Bewusstseinslage*. It is said to be a modification of consciousness which cannot be identified with sensation idea or feeling.[27] It has no specific representation of its direction or of its goal.[28] We cannot say that attention is absent in such cases; yet we cannot define

such attention as sensory clearness or clearness in any form. The perseveration theory does not involve these difficulties.

We must thus, describe the attentional state in a different way. A psychic process, under a variety of conditions, is continuously experienced for a relatively long duration. As a consequence, other contemporary states which abide in consciousness for a shorter period or are intermittently experienced, become less *vivid*. There arises in this way a difference in *degree* of vividness. The prolonged experience of a state leads to the arousal of its associations and meanings which in their turn, give the mental state a longer temporal span of existence. In this manner the *attended* state is said to *develop* itself. In the same way, the perseveration of an idea or a perception leads to the rise of the appropriate motor and organic accompaniments. Thus, attention is said to be a preparation for action. The persistence of states may be induced by an antecedent constellation of ideas and images, by emotions or by motor attitudes. It presupposes a lower threshold on the sensory side and a plasticity of the central nervous system, so that impressions may arise quickly and endure so as to influence the psychic and bodily processes of the organism as a whole.

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Objective Examinations

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Introduction.

Examinations have existed throughout historic times. But they have never been looked upon with a friendly eye. The common practice is to denounce them freely and then to tolerate them as a necessary evil.

Examinations of some sort there must be, if education is to go on at all. For the aim of education is to bring about certain changes in the pupils, and unless steps are taken to measure the changes, teachers will grope about in the dark. The essence of examination is measurement. The evils and dangers attendant upon it are the evils and dangers of bad measurement. The ideal examination is a netural thing as neutral as the foot-rule or the thermometer. The right thing to do them is not to end the examinations but to mend them.

Unreliability of the traditional Examinations.

The fluctuating and subjective nature of a judgment on an essay was illustrated by the results of our experiments communicated to the Lahore Science Congress, 1927. The intercorrelations of independent examiners of essays were found to range from ·27 to ·76. Now it is evident that the marking of every examination into which composition enters must to some extent be vitiated in the same way as is the marking of the essay itself. The written examination in present practice usually consists of from five to ten questions and these questions are really so many short essays. The man who marks an examination paper in history marks power of essay writing as well as history. He is unconsciously

influenced by the handwriting, the spelling, the appropriateness of wording and many other adventitious things.

The results of the following experiment will show in what varying degrees the different examiners are influenced by these things.

The papers in English, History, Geography and Mathematics of classes IX and V of two High Schools of Dacca were examined independently by four examiners. The following are some of the results:

Subject.	Paper.	Marks allotted by different examiners out of a maximum of 100.				Range.
		A	B	C	D	
English ...	No. 1	52	44	48	43	9
	,, 2	29	45	28	40	17
	,, 26	28	20	24	32	12
History ...	,, 1	59	72	55	59	17
	,, 14	31	35	23	28	12
	,, 23	57	56	43	37	20
Geography ...	,, 1	42	46	50	57	15
	,, 2	51	59	61	63	12
Mathematics ...	,, 1	54	57	62	68	14
	,, 2	77	88	85	95	18

The intercorrelations of the examiners in the various subjects ranged from ·60 to ·84. The correlations were highest in Mathematics and lowest in English and History. This is obviously a bad state of affairs: So many problems in the operation of our schools and colleges such as promotion, prizes, scholarship, admission to higher institutions, and indeed the whole machinery of educational institutions, hinge upon the assignments of marks.

Experiments with Objective Examinatoins and Discussion of Results.

Experiments with a new type of examination have been in progress in the Dacca Training College for the last 3 years. This new-type examination may be called Objective Examination, for a large part of the purpose in employing this new technique is to make the marking of the pupil's response objective, that is, independent of the teacher's personal judgment. This examination has been given to classes IX to V of three High Schools in English, History, Geography and Mathematics along with the usual Annual Examination. The use of a large number of small questions and the very small amount of writing demanded are the characteristics of the examination.

The new-type questions are special, narrow and definite as opposed to the general, broad and indefinite questions of the traditional type. In the latter the answer is long, discursive and impossible to rate accurately. In the former the answer is small and unequivocal. It is often a number, a letter, a word, a line drawn round or under an expression or at most a sentence or two.

The answers of the O. E. (Objective Examination) in all the subjects were rated independently by two examiners. The intercorrelation of the examiners in the various subjects ranged from ·97 to ·99. This new examination is thus quite or nearly perfectly objective and thus eliminates most of the unreliability due to personal opinion.

The correlations between the O. E. total and the Annual Examination total in these four subjects were ·80 in class IX and ·82 in class V. (The other classes were not examined in all the subjects.) The correlations in different subjects ranged from ·52 to ·86. This shows that the new examination measures at least what the old examination measures and is an answer to the critic who would say that the new examination

may allow more objective marking but does not actually measure what it is meant to measure.

In one case (Class IX English of 1926) the correlation between the new examination scores and the annual examination scores was found to be only ·51. The annual examination papers were then re-examined by two fresh examiners. The correlation with the pool of these scores and the new examination scores rose to ·86. By a similar procedure the correlation in History rose from ·62 to ·69, of Geography from ·56 to ·65. In fact, when the rating of the old examination is made more reliable by taking the average of the ratings of two or more examiners it generally yields a higher correlation with the O. E. ratings. This is an indication of the greater validity of the O. E.

The O. E. permits a much more extensive sampling per unit of time than do the traditional examinations. It can thus be made more representative of the total field of the pupils' study. The more representative is the sample, the less active is the hand of chance. The questions selected depend in part upon the examiner's point of view at the moment. On a different day a different set of questions might be drafted. The correlation between the results of the same batch of students on the same course held at different times by the same examiner or at the same time by different examiners by the traditional examination is never high. The O. E. yields much more consistent results. The dangers of examination questions being known either by accident or by cunning anticipation is negligible in the O. E.

O. E. forces the child to react to the facts and ideas which the examiner deems important instead of allowing the examinee to choose his line of battle. The teacher who has noted the facility with which the pupil can distort the ordinary questions to make it fit the knowledge he happens to possess will recognise the advantages of the more mechanical form of the O. E.

The O. E. is less fatiguing to the examinee as well as to the examiner. The examinee has not much to write and can finish it in half the usual time. In this examination the examinee has no opportunity to describe at great length a knowledge which he does not possess. It takes a much longer time and much more thought to make the new-type questions. Time, however, is saved in marking the papers and the more papers there are the greater is the saving. In other words the time-consuming task is, in the case of the O. E., shifted from the marking of the papers to the preparing of the examination. And that is where it rightly belongs. There is nothing productive, nothing creative in the marking of the papers. Everybody recognises it to be drudgery. With the traditional type of examination it is not only drudgery but drudgery largely wasted. The results are so unsatisfactory, so unreliable. On the other hand the making of a good paper is worth doing. It sets a standard for subsequent work and will be preserved.

We have shown that the new examination is better for testing. But no examiner should draw up an examination paper without asking himself the question: How is this going to affect the teaching? How will the small questions of the new type affect the teaching?

There was a time when it was held that the proper way to develop the muscles of the arms and chest was to use large and heavy dumb-bells. Now the dumb-bells are small and light. The modern gymnast is trained with light exercises and light apparatus. So too should be the case in our schools. Many would say that the small tasks give no training in "sustained effort." The reply is that there is no such thing as a general faculty of "sustained effort" and that effort is more a matter of interest than of training. The best way to prepare for big tasks is by doing many little tasks rather than by doing the big tasks themselves. In our schools big things should occasionally be done. But for purpose of

gaining power through practice, for the purpose of revealing the pupil's weakness and strength, and for the purpose of measuring ability and attainments with a reasonable degree of exactitude, there is nothing to compare with the small task and the small test.

Limitations of the O. E.

Having said so much in praise of the O. E. let us now turn to its obvious limitations.

O. E. provides little or no opportunity for training in organisation and expression of thought. The O. E. is thus unsuitable for courses in composition in which the essay is the chief instrument.

There is always a tendency for O. E. to become highly factual.

In O. E. guessing effects disturb the accuracy of results to greater or less degree. Various suggestions have been made to remedy this defect. But the results are not yet conclusive.

O. E. questions are very lengthy and involve cost of printing. But cost of answer papers is reduced.

Conclusion.

The O. E. is still in its infancy. It has not yet reached a stage when we can dispense with the traditional examination. There is still ample room for the co-existence of both the examinations. They should serve to supplement one another and provide a system of checks and balances, one against the other. The measurement of factual mastery should, however, be divorced more or less completely from traditional examination and handled by the more objective and reliable technique of testing.

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An Analytical Study of the Memorisation Process*

H. P. Maity

The Ebbinghaus method of complete memorisation has been extensively used for the purpose of scientific investigations on memory. It has given us very valuable knowledge about the conditions of rote memorisations and such knowledge has been applied for the learning of many school subjects. The method, however, differs from a strictly experimental method in so far as it does not undertake to observe or record the effect of a simple mental function such as sensation or perception. It sets the mind working in certain standard subjective and objective conditions and estimates the gross capacity for memorisation in terms of the number of presentations required to learn the given material. In this respect it is like a Performance Test, and, as such, it does not take interest in the analysis and consideration of the errors that are almost invariably committed during the course of memorisation. The purpose of the present paper is to show that the consideration of these errors is helpful for psychological analysis of the mental functions involved in memorisation of nonsense syllables.

A list of twelve nonsense syllables was shown to 38 students of the Psychology Department by means of a hand-driven Exposure Apparatus. Each syllable was exposed for one second. At the first presentation the exposure time was 2 seconds and the subjects were asked to read the syllables very carefully. After the whole list was shown, the subjects had to count from 1 to 20 and then to reproduce the given list in the correct order. The subjects were allowed to pronounce the syllables to themselves, but not to try to remember them by associations, or by adopting any preconceived plan or with the help of any secondary cue. They were specially

* Read before the Indian Science Congress, 1928.

asked not to recite any syllable during reproduction and were required to attend to each of the twelve syllables equally. Instead of taking a general introspection from the subject, a questionnaire asking detailed information on a large number of topics relating to his mental condition was supplied to him for the purpose of filling in.

With the help of the questionnaire return of introspections, we could sample out those cases which seemed to conform approximately to our conditions. Out of 38 records, 13 were rejected in this way and of the remaining 25, 18 were finally chosen for consideration. From these 18 records three groups have been formed, 6 cases being included under each group. The first group consists of Good learners, the second of Medium learners and the third of Bad learners. The classification has been based on the gross memorisation capacity of the individuals. We have denoted the gross memorising capacity by what we have called here the "Memorisation Score." This capacity recorded in an actual case of memorisation varies inversely as the number of presentations required to learn the given material. Now, assuming that the ideal capacity of memory would consist in reproducing the given series after one single presentation, we can express the memorisation capacity in any actual case as a percentage of this ideal capacity by dividing 100 by the number of presentations. The M. Score of our first group is 12·8, that of the second 6·7, and that of the third 4·7. Thus it would appear that the memorisation capacity of the second and the third groups of our subjects is $\frac{1}{2}$ and $\frac{1}{3}$ respectively of that of the first.

Distribution of the different kinds of errors in the three groups of memorisers.

The material to be learnt in the experiment consists of two separate elements (1) syllables and (2) connection between any two successive syllables. Errors may therefore

be committed either with reference to the syllables or the associations between them. Errors may again be considered under two other heads, *viz.*, errors of omission and errors of commission, the former consisting in mere inability to recall a syllable or an association and the latter in positive modifications and insertions.

Under errors of omission I have included (1) lapse of syllables or (2) lapse of associations between syllables after these have been already reproduced more than once. Under errors of commission have been included three kinds of errors, (1) Perseveration of wrong syllables (2) Perseveration of wrong associations and (3) Insertion, *i.e.*, reproduction of syllables which seem to have no apparent resemblance with any of the given syllables. The following table gives the distribution of the different kinds of error in three groups of learners.

	Good memorisers with memorisation score of 12·8.	Medium memorisers with memorisation score of 6·7.	Bad memorisers with memorisation score of 4·7.
Lapse of acquired syllables.	3·3	5·2	6
Lapse of acquired associations.	1·2	3	3·8
Wrong syllables persevering.	1·7	3·5	5
Wrong associations persevering.	1	2·8	4·2
Insertions.	·3	·8	·8

The figures indicate the average number of syllables or associations per individual in the three groups.

Inasmuch as errors continue to occur till the complete reproduction of the given series they can be described as direct causes of inefficiency. Low M. score of poor learners

indicating their inferiority, are not however traceable to any single variety of errors; but it seems that they have a marked tendency to commit the errors to a greater extent than the good learners. A method of investigation that uses complete success of performance as an index of memory capacity, as the Ebbinghaus method does, should be interested in the study of the errors. As it is actually applied, the Ebbinghaus method neglects to consider the errors in themselves and in doing so, it seems to attach only negative significance to their occurrence. They are regarded, in other words, as signs of weak retentive capacity without any significance in themselves.

I would now proceed to examine critically, though briefly, some of these errors and try to see if they are significant in themselves, and if they can throw any light on the factors responsible for the actual memorisation scores. The standpoint of the analysis given below is more logical than psychological, as the introspective data were not sufficient. I have however used introspective data for checking up the conclusions of the analysis whenever it has been possible. The conclusions are based on the results of and have reference to the actual experiments performed.

Analysis of errors.

(1) *Errors of omission.* Such errors would at first sight appear to be due to lack of sufficient impression on the mind or to inherent weakness of its retentive capacity. Though it may be so in some cases, it seems that all the cases of loss of syllables or associations cannot be adequately explained in this way. After a syllable or an association has been correctly reproduced more than once already its omission in subsequent reproductions means more than this. It means a positive loss and forgetting. It perhaps indicates a limitation of mental organisation, either peculiar to the individual

or dependent on the mental situation of the moment of learning. This is suggested by the examination of some of the peculiar conditions under which the loss occurs, *e.g.*, when in the later stages of learning a new syllable comes up for the first time or an old missing syllable reappears. It appears as though the gain of a syllable must pay its price in the shape of loss of another. It is not only the recently acquired syllables that are lost in this way, but also old syllables are subjected to such sacrifices. Another condition for the loss of an acquired syllable is its disjunction or separation from its usual associate. But cases of loss under this condition are very rare in Bad learners. They seem to retain the syllables more by their individual impressions than by force of associations with other syllables. Good learners receive and retain them more in groups. Hence errors as to relative order of the syllables are also less in them.

(2) *Errors of commission.* These consist of wrong syllables, wrong associations, and insertions. Insertions seem to be determined by influences outside the limit of the given material and hence have only negative significance for our study. They are, the most rare examples of errors found in my subjects. I could not have sufficient introspective data to form any opinion about their significance.

Wrong associations should be distinguished from mere juxtaposition of two independent syllables. Where two syllables in incorrect order are repeatedly reproduced in the same incorrect order even after the syllable, that would restore correct order by being placed between them or beside one of them, has been already reproduced, it has been regarded as a case of wrong association. These associations are of two kinds: Remote, *i.e.*, from one syllable to another distant syllable in the forward direction, and backward, *i. e.*, between any two syllables in the reverse direction. It is significant that wrong associations are more numerous in Bad learners than in Good learners.

This also supports the contention that they depend more on individual impression of the syllables than on their associative strength.

Wrong syllables as well as wrong associations may be originally formed on account of imperfect and careless perception of the syllables. The attention may very likely be unequally and irregularly distributed over the series, some of the syllables being read with more care than others. Perseveration of the wrong syllables and associations may therefore be due to the subject continuing in the inertia of his first or first few erroneous perceptions. But we can also point to another and perhaps more important reason for this perseveration. The very act of Reproducing may have either a favourable or a deleterious effect on memorisation. The mind receives impressions of the material not only through the Presentation but also through the act of Reproducing. Indeed, the impression due to the latter condition is stronger than the impression of presentation, for it is an impression not only by seeing but also by doing, and the visual impression from the syllables as they are being reproduced, is also stronger. When, in the early stage of learning, the Presentation series and the Reproduction series differ in the relative order of the syllables as they usually do in the case of Bad learners, the two factors of Presentation and Reproduction seem to act in opposition and this necessitates larger number of presentations which have the double task of removing errors as well as of establishing right associations and correct syllables in their stead. When, on the other hand, the Presentation series and Reproduction series coincide with each other in the early stage of learning the two factors of Presentation and Reproduction seem to help each other and this leads to quick memorisation. This suggests that Reproduction is itself an important factor in memorisation and explains why some individuals will do well and others badly with the procedure of reproduction after each presentation. The above

analysis throws doubt on the correctness of the usual method of inferring and evaluating Memorisation capacity from the factor of Presentation alone.

We should distinguish a second group of wrong syllables which are very interesting in their origin. We may describe them as Fusions of two Component syllables. These may occur even after one of the component syllables has been already reproduced in its right spelling. That they are really fusions and not mere mistakes in spelling is indicated by the change they subsequently undergo. The modified syllable continues to be reproduced till one or both of the supposed components appears. Usually both the components simultaneously appear in the same Reproduction series. In other cases, they appear alternately in two successive series. The component syllables may again be lost in subsequent Reproduction series and the old fusion may reappear. Here is an example :

4th Reproduction.....Tof (fusion of Tas. Pof.)

5th „ .....Pof
6th „ .....Tas
7th „ .....Tas, Pof
8th „ .....Tas, Pof
9th „ .....Tof
10th „ .....Tas....Pof.

A curious case of fusion is afforded by an instance in which the same syllable fused with two different syllables——with one, by property of its nearness in serial position and with the other, by virtue of similarity of its sound. The two fusions never appeared in the same Reproduction, but alternated from one series to another.

Some theoretical points.

In connection with perseveration errors of wrong syllables and associations, I have suggested that it is perhaps

wrong to evaluate memory capacity from member of Presentation alone but that Reproduction as a secondary factor responsible for impression and retention should also be taken into account. Likewise from a consideration of the fusion and loss of acquired syllables it would appear that the Ebbinghaus method of memorisation is something more than a test of memory capacity, and that it measures mental organisation as well as memory.

Fusions and lapse of acquired syllables, in some cases at least, seem to be phenomena peculiar to the process of recall and related to the subject's capacity for organisation. We know that though six or seven syllables can be reproduced after a single presentation, addition of a few more to them produces confusion and results in the recall of only 3 or 4 syllables. It appears as though in recall we have a limited capacity for organisation of the materials and the important factor for this limitation is some sort of interference apparently due to the fact that the task is decidedly above the span. The same kind of interference seems to be at work in fusion and loss of syllables. It is significant to note in this connection that the errors under discussion, specially lapse of acquired syllables, occur more towards the middle part of the learning period. With the progress of learning there devolves on the subject the twofold task of conserving the already acquired and of acquiring new syllables and this seems to constitute a favourable condition for the interference errors.

During the course of reproduction we have instances of mutual interference of syllables. When one of the mutually interfering syllables is retained the other is dropped and *vice versa*. In some cases fusions may be resolved into and followed by such mutual interferences of the fused components. This confirms our contention as to fusions being the product of mutual interference of syllables. Similar interference is also found in respect of two different associations with the same syllables—one being wrong and the other right. These cases

of mutual interference look like Freudian conflicts of two opposed tendencies. Like composite word-formations of slips of tongue fusion may be described as a compromise between two different syllables, or rather two different reproduction tendencies. I have already stated that the mode of resolution of fusion is very interesting. In some cases it is broken up into two component syllables and thereby it causes its own disappearance. The two syllables when recovered simultaneously are thrown off far apart from each other as if by the mechanism of dissociation. In other cases only one of the components appear in one reproduction series and the other component in the next following. It seems as though the condition for the final resolution of the fusion is unhindered expression of one of the syllables. In many cases the two component syllables would appear in alternation only, showing thereby that compromise has been followed by successive inhibition.

These passing inhibitions peculiar to stages of imperfect learning would at first sight appear to be intellectual in character. Freud has shown however that emotional disturbance is a necessary condition for the occurrence of many common errors of our ordinary life. It seems that the possibility of the operation of the condition is not wholly negatived in the memorisation of the nonsense syllables. Most of the subjects have reported that about the middle part of the presented list they felt themselves 'overpowered' and that anxiety was present not only during impression but also during recall. Such feelings are reported less by those subjects who began reproducing the syllables in the order of their presentation. They are peculiarly free from perseveration of errors. They seem to have achieved higher score by virtue of this more markedly objective turn of mind which seems to have enabled them to avoid needless errors through greater freedom from feelings. Whether emotional disturbance can be inferred to have been present or not in the mental situation

of the subject during impression or recall, we can perhaps more surely conclude that some of the errors are due to interference of separate active tendencies of recitation and recall and that memorisation by the Ebbinghaus method is a complex performance involving different mental functions, but specially the function of mental organisation.

I have tried to show that errors of reproduction are significant for psychological analysis of the mental characteristics of learners and that they are at least partially responsible for the memorisation score. It would be interesting (1) to check up the tentative conclusions by reference to more detailed and controlled introspection on the conditions and nature of the errors and also (2) to investigate the influence of different conditions of learning on the various kinds of errors and thereby to understand the *raison-d'-etre* of the specific effects of these conditions on the course of learning.

Visual Estimation of Angles

M. N. Samanta

Visual estimation of angles is a phenomenon which appears in many contexts in Psychology. It is interesting as a fact which shows the working of the visual apparatus ; is also relied upon as a principle of explanation in the field of visual space perception. The investigation reported in this paper is concerned with the question of accuracy of visual estimation of angles.

The experiments were performed with the help of five different subjects all Post-graduate students in Experimental Psychology. The time taken is about five months from July to November, of the present year. The specially devised stimulus was used for the purpose. It consisted of two movable arms on a circular grey field. On the back there was a scale representing the angles. A second arrangement of the same nature was placed in the hands of the subject.

The procedure adopted was to expose angle of a definite value on the first appliance and the subject was asked to reproduce on the second. Five standards varying from 50°-90° degrees were presented. The general method was that of Average Errors. Fifty readings were taken for each subject for each standard. Thus in all 1,200 experiments were performed. The usual precautions relating to the method adopted were taken.

It was found in the course of the series of practice experiments that judgments were given sometimes in terms of the field and sometimes in terms of the arms and that there was a difference in the result in the two cases. The investigation was thus directed to bring out the amount of accuracy in these two cases.

TABLE I.

(Comparison of average values in the case of judgments in terms of arms and in terms of field.)

Subject No.	Standard.	Average in terms of field.	Average in terms of arms.
1.	60°	60·54	58·86
2.		60·42	60·00
3.		60·26	61·55
4.		57·40	.....
5.		61·30	61·40
1.	90°	90·78	89·20
2.		89·98	90·84
3.		91·64	89·50
4.		90·44	.....
5.		90·18	89·78
1.	70°	69·86	69·66
2.		71·28	69·56
3.		69·80	67·45
4.		67·70	.....
5.		71·60	72·58
1.	50°	50·48	48 86
2.		50·28	41·80
3.		49·78	48·80
4.		47·98	.....
5.		50·78	52·40
1.	80°	78·10	79·90
2.		79·64	79·58
3.		79·76	77·30
4.		77·56	.....
5		81·46	79·46

It is evident from the table that the judgment in terms of the field is under-estimated in most of the cases. That means the judgment in terms of arms is nearer to the standard.

Table II.

(The amount of error in the estimation of angles in terms of the field and in terms of arms.)

Subject No.	Standard.	A. D. in terms of arms.	A. D. in terms of field.
1.	60°	2·53	2·25
2.		3·55	2·02
3.		1·59	1·40
4.		2·34	.....
5.		1·73	3·73
1.	90°	1·08	1·71
2.		1·38	1·34
3.		1·83	2·65
4.		2·34	.....
5.		1·32	2·78
1.	70°	2·88	2·59
2.		2·15	1·88
3		2 70	2·50
4.		2·97	.....
5.		1·38	4·96
1.	50°	3·23	2·63
2.		2·33	1·93
3.		2·36	2·27
4.		2·28	.....
5.		2·54	3.44

Subject No.	Standard.	A. D. in terms of arms.	A. D. in terms of field.
1.	80°	2·81	2·39
2.		2·23	1·57
3.		2·67	2·20
4.		3·36	.....
5.		2·82	2·49

It is apparent from the table that the estimation in terms of the field is more accurate inasmuch as the error values are generally smaller. The actual difference in the error values, however, is not sufficiently large.

The introspection of subjects goes to show that the estimation in terms of the field is more difficult than in the other case. This difficulty arises from the fact that the judgment is complicated very often by a shifting of attention from the field to the arms.

The data obtained in the course of this investigation are in some respects very interesting. It is generally believed that all acute angles are over-estimated whereas obtuse angles are under-estimated. But the results that we have obtained show that with very few exceptions the standards which were mostly acute angles have been under-estimated. It is early yet to assign any cause for this fact. The smaller account of error in the case of estimation in terms of the field, however, is easy to explain. In this case usually two criteria, *viz.*, that of the field and that of the enclosing arms, have been employed. The error by one method has usually been checked by the other method. As a consequence there has been smaller amount of error.

'Stimulus-Error' in the Determination of D. L.

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Recognition of the distinction between measurements of mind and measurements of body or between sensation and the object of sensation (the stimulus), was the keynote of Fechnerian Psychophysics. There was a vigorous opposition to the programme of mental measurement on the ground of what is known as "Quantity objection," *i.e.*, a denial of the possibility of mental measurement. The main defence of the Fechnerian School was the factual results of the experimental measurements. To this, the oppositionists, Brentano, Exner, Müller, Ward and others replied that Psycho-physicists confused the sensations with stimuli.[1]

Prof. Titchener accepts the validity of mental measurement but points out that two different attitudes are possible, the process attitude and the stimulus attitude in the judgment of sensory qualities ;[2] he further insists that the process attitude is the only proper attitude for experimental work in Psychology. According to him the Psycho-physicists generally confuse the process with the stimulus and thus an error creeps into observation. This is termed the stimulus error.

The divergence in the experimental data of different workers in regard to the comparison of supraliminal sense distances is explained by Prof. Titchener[3] in terms of stimulus error. The discrepancy found by McDougall and others in the cutaneous perceptibility of English men and Torres Straits islanders is similarly explained. Titchener points out the

equivocality of judgments under the stimulus attitude as they are obtained on the meaning level.[4]

Unfortunately this interesting discussion was carried on in regard to epistemological issues and was not followed by any significant experimental work until very recently.

It was experimentally demonstrated by the works of Friedlander[5] and Fernberger[6] that a "trained observer is able, by an attentional abstraction and isolation, to judge intensity differences of a single modality from a complex, in which several modalities of sensation are present simultaneously, and in the case of lifted weight stimuli, the following instructions are capable of fulfilment; namely, judging the intensity of the pressure sensations on the tips of the fingers; judging the intensity of the kinaesthetic sensations localised in the wrist; and judging by assuming a stimulus attitude the relative intensity of the weights themselves." Prof. Fernberger agrees with Titchener that the judgment under the stimulus attitude is based on a complex perceptual process on the meaning level and thus the stimulus attitude may lead to an equivocal sort of judgment.

Subsequent workers, Reid,[7] Rudisill[8] investigated the effects of attitude on the measure of sensitivity. They came to the following conclusion: (*i*) the precision and D. L. values vary with different attitudes; (*ii*) the stimulus attitude yields the highest precision of judgment; (*iii*) there is no certainty of the constancy of attitude for any large number of successive comparisons; (*iv*) it is easier to maintain the constancy of the stimulus attitude than that of other attitudes, because the former is the customary and naive attitude; (*v*) judgments passed under each attitude are equivocal; under the stimulus attitude the equivocality is due to the complex nature of the critaria of judgment where as under the other attitude the equivocality may be due to shift of attitude. Further Rudisill emphasises that the statistical values are devoid of significance when based on

judgments without any introspective check upon the constancy of attitude.

None of these investigators made any attempt to study the effects of the stimulus error on the Weber's law. Moreover some of the observers' introspections reported to have been made in " uncontaminated attitude " appear to me to be not without " contamination."

In view of these I have been carrying on a series of experiments, the purpose of which is to determine D. L. in the discrimination of weight and to testify the validity of Weber's law (*i*) under each uncontaminated attitude, (*ii*) with an introspective check on each judgment. I have been further trying to enquire into the exact nature of the weight-consciousness under each of the different attitudes (pure and uncontaminated) and to determine how far the equivocality of judgments is due to the stimulus error on the one hand and to the shift of attitude on the other.

The following conclusions may be drawn from the data so far obtained :—

(1) The stimulus attitude yields the least D. L. values and kinaesthetic attitude the highest, while the precision is keenest in the kinaesthetic attitude.

(2) Weber's law seems to be valid in each case.

(3) Sometimes it becomes difficult to keep one attitude constant even during the period of one observation, not to speak of successive comparisons. It is not easier to maintain the constancy of stimulus attitude than to maintain that of process attitudes. The uncontaminated stimulus attitude is not the usual attitude as presumed by other workers in this field.

(4) Judgments made in the pure uncontaminated attitude are unequivocal, *i.e.*, the criterion of judgment remains the same ; in the stimulus attitude, it is a simple, unanalysable experience of weight which is located on the object ;

with it appears the visual image of the object, or the visual image of the locality of the object. In the pressure attitude a pattern of pressure is the basis of judgment; besides the pressure, the pattern has also a visual attribute. This pattern of pressure is located on the tips of the fingers, the visual image of which appears with vividness. Likewise, in the kinaesthetic attitude a pattern of kinaesthetic sensation forms the basis of judgment. This pattern also has a visual character. The visual image of the wrist or the image of its locality, also is apprehended.

The process, kinaesthesis or pressure appears in consciousness as a definite visual configuration, location and quality which impart it a meaning.[9]

Different muscular adjustments are discernible in different attitudes. Shift of attitude is often preceded by variation of the muscular adjustment but in some cases these variations become noticeable after the change in the attitude, and in some other cases they are not noticed at all.

(5) The D. L. values remain relatively constant when attention is directed exclusively to the stimulus, the pressure or to the kinaesthetic factors. The values vary when the attention shifts from one to the other of these factors. Although the subject assumes a stimulus attitude, he is aided somehow in his judgment by pressure and kinaesthetic criteria; the process criteria in this instance cooperate with the stimulus attitude and give rise to the deviations in the D. L. values.

In the same way a subject working under the conditions of the process attitude may lapse into an awareness of the objective stimulus. Here, too, there would be a deviation in the D. L. values than would arise under the process attitude unaided by object-reference. If this latter is to be called the 'stimulus error,' as it has been called, the former type of variations should be termed the 'process-error.'[10]

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Notes and Abstracts

Some Implications of Social Psychology: *By O. H. Harland, M.A., Alfred A. Knopf. Price 3/- net.*

The author describes this little book as the expression of an attempt to reach some implications of a social psychology that is other than a tiresome enumeration of all the motives that actuate man in his social relations. He claims to have worked as far as possible from "first principles" but in his regarding the concepts of Le Bon, McDougall and Trotter as fundamental, he is probably mistaken, because, as Freud has pointed out, no one of these authorities has paid any heed to the emotional ties which really constitute the essence of the group mind. Nevertheless, there is much that is well worth reading in the book because it gives us a good deal of the history of mankind in a refreshing, if not altogether novel, form. Some readers may find it hard to accept the author's conclusion that modern society's main difficulty is a conflict between its own efforts towards stabilisation and the drift towards mobility. The author appears to ignore a far more fundamental aspect of the situation, namely, the fact that the restraints which the individual must undergo in order to live usefully with others, have not yet become really tolerable to him. Mankind finds it increasingly harder to accept the feeling that there is no moral intuition to preserve certain

cultural demands, such as the rights of property and the rules of privilege. So long as there is marked inequality or no opportunity for instinctual satisfaction, civilisation cannot be said to be fulfilling its task well. The author seems to have overlooked the fact that mankind has, as a whole, no love for instinctual renunciation and moreover is not open to conviction by argument of its inevitability. Probably the best outlook for civilisation lies in a revision of all its sanctions in the light of reality and an acceptance of the position that human laws are for the sake of human life and have no other relation whatsoever.

Problems of Instinct and Intelligence : By Major R.W.G. Hingston, M. C. Edward Arnold & Co. Price 10/6.

Major Hingston has written a most fascinating study of instinct and intelligence in insects based upon a wide experience as a field naturalist coupled with a gift for accurate observation. The author recognises the limitations that are set to the investigation of all mental processes, human or non-human, and is fully aware that all we can do is to draw inferences from observed acts of behaviour with complete appreciation of the dangerous pitfalls which beset this type of scientific research. While admitting freely his admiration for the work of Henri Fabre on the life-histories of spiders, Major Hingston repudiates the dogmatic opinion of Fabre that all insects have no intelligence. For Fabre the insect has no choice what it shall do; it possesses no guide but the unconscious promptings of instinct. According to Fabre, instincts have never grown and developed; they came complete in all particulars. The past added nothing to them ; the future will find them exactly the same as they are to-day. Little wonder that Fabre is a determined anti-evolutionist and can see nothing in the philosophy of Darwin but " an ingenious game in which the arm-chair naturalist, the man

who shapes the world according to his whim, is able to take delight." Many will agree with the author that opinions of this description cannot be taken seriously and will incline to his view that all so-called instinctive action began as a reasoned act and that this act, through being constantly repeated, tended to lose the reasoning element and to become more and more unconscious. Although Major Hingston admits that no one can demonstrate with absolute certainty the source from which an instinct has originated, it is possible to point out the steps along which it probably evolved. While subscribing to the view that instinct is the main factor in controlling the activities of insects, Major Hingston will not agree with the general opinion that insects are wholly instinctive. He prefers to adopt the attitude of Huber and credit insects with a "little dose of reason." To support this contention, the author cites numerous examples of insect activity which appear to prove that in certain circumstances, beetles, wasps, spiders and ants can *reason, adapt, reflect, remember, imitate* and *learn from experience.* Major Hingston maintains a suspended judgment as to the existence or otherwise, in insects of a "sense" unknowable to human beings. On the whole he inclines to the view that the insect mind differs from the human mind in degree rather than in kind and believes that the same fundamental qualities exist in the brain of man and in the brain of the insect. He holds that the psychological tree has two great branches, the branch that represents the growth of intelligence and the branch that represents the growth of instinct. Man stands at the summit of one branch while the insect crowns the other, for in the insect instinct has reached its highest development. It is a pity that so valuable a book should have so poor an index. It is to be hoped that in its next edition Major Hingston will oblige his readers by including an index worthy of the text. To insure this he will probably have to employ a German.

Two Essays on Analytical Psychology: *By C. G. Jung. Translated by H. G. & C. F. Baynes. Bailliere, Tindall & Cox. Price 10/6.*

Contributions to Analytical Psychology: *By C. G. Jung. Translated by H. G. & C. F. Baynes. Kegan Paul, Trench, Trubner & Co., Ltd. 18/-.*

The first of these two books is made up of two papers which Jung published in English under different titles in his Collected Papers on Analytical Psychology, edited by Constance Long. Of the first essay only the framework of its earlier form can be recognised, and so much new material has been added to the second essay that both works start afresh, so to speak. The second book represents a second collection in English of further outpourings from the amazingly vital mind of this eminent psychologist, the depth and breadth of whose culture remain a source of stupefaction to the workaday psychologist. The *pièce de resistance* of the book lies in the first seventy pages in which Jung re-elaborates his theory of Psychical Energy originally promulgated under the title of the Theory of the Libido. When Jung broke away from the school of psycho-analytical psychologists, his belief in such a transformation of libido as that implied in the process of desexualisation was one of the indictments in the charge of heresy brought against him by orthodox Freudians. At that time Freud had not laid stress upon the occurrence of desexualisation, nor had he said much about instincts inhibited in their aim, except in so far as such processes are implicit in his doctrine of sublimination. Jung's heresy in this connection, however, went further than merely teaching that Libido could become desexualised; he also taught that Libido is originally not sexual at all. He regarded the various instincts as issuing from undifferentiated primal life-force, and to this primal life-force he unfortunately

applied the term Libido. His doing so introduced a quite unnecessary confusion into a subject that was already sufficiently complicated. Jung sees the primal libido as a will-to-live; adaptation to life, the fulfilment of a task, is the chief incentive; pleasure is obtained as a reward for duty done. Dr. T. W. Mitchell has compared Freud's outlook to that of Adam before the Fall—the pursuit of pleasure in a paradise of desire, marred only by the interdict placed upon the fruit of the forbidden tree; while Jung's outlook is rather that of Adam after the expulsion from the garden, confronted with the task of adaptation if he would live. The papers immediately following this essay, namely "Spirit and Life, Mind and the Earth," "Analytical Psychology and 'Weltanschauung,'" and "Woman in Europe," represent Jung's latest work, and they all reveal how far his psychological outlook has extended beyond the characteristic confines of post-analytic theory. In this category the most notable contributions are the essays entitled, "Love Problem of the Student" and "Psychological Foundation of Belief in Spirits." The first of these two was written for students of Zurich University who sought the author's practical counsel rather than a scientific disquisition. The latter was composed especially for the Society for Psychical Research and it constitutes a magnificent example of Jung's psychological common sense for the author confines himself strictly to the limits of science and avoids the question whether spirits are real or concrete objects endowed with an independent existence. Jung discusses the difficulty of getting reliable evidence of the objective reality of a spirit and shews how the spiritistic proofs are as a rule nothing but psychological products dependent upon the unconscious of the percipient. Even the so-called physical effects always depend upon the co-operation of the percipient and seem to be exteriorised effects of unconscious complexes. While personally convinced of the reality of such facts, Jung finds himself unable to accept them as evidence of the independent

reality of spirits. Teachers and school masters will find much to enjoy and to ponder over in the latter portion of the book which is devoted to a collection of essays on psychology and education, among which are three lectures the author delivered in London in 1924. The translators are to be congratulated on their work in rendering the original German into such admirable English. Both books are thoroughly well indexed. Indeed, the only fault possible to find with these volumes is in the bindings which seem to contain some ingredient particularly acceptable to cockroaches with the result that the exposure during one night to the voracious appetites of these exotic pests is sufficient to ruin their attractive appearance.

The Child in Primitive Society : *By Nathan Miller. Kegan Paul, Trench, Trubner & Co., Ltd. Price 12/6.*

The author of this book has been at much pains to show how slightly has civilisation brought about any real change in the conditions and traditions of the educational method. He has drawn a very vivid picture of the overweening prestige of all pedagogy to the end that social continuity is preserved at the expense of the child's development. The spirit of primitive educational methods, engrossed in fashioning and tutoring the sentiments and attitudes of the child, continues to brood over the home, the school and the university of modern man with what results he is now just beginning to realise. Vested interests have so far sacrificed the child to the welfare of ephemeral and vague social survivals with the result that our present day social, national and international relationships are little else than a confused welter of empty slogans and unknowable symbols. Educationalists have got to learn that the time is past wherein to stress institutional devotion as the actuating motive for the acceptance of a world of pure convention of which much is unbelievably crass and

unthinkably stupid. Children can no longer be taught either to accept or to submit to the various connotations of such catchwords as "the church," "the estate," "the family" or "the blood." In the light of reason, at least, it is time that this pressure making for conformity and for the perpetuation of worn-out symbols should make room for a method whereby the child is at liberty to express *himself* and perpetuate *himself* through the development of *his own* individuality. Education is, after all, only a means to an end. In the past it has been used more or less as the vehicle for the perpetuation by the elders of conventional fictions so that we need not be shocked when a great modern educationalist writes: "Damn the education of the young...they are too good to be fouled in this way!"

Owen Berkeley Hill,
M.D. (Oxon.)

Ranchi, October, 1928.

Journal of Experimental Psychology, April, 1928.

Remote association tendencies in serial Learning :
Margaret E. Hall.

The theory that in learning a series of items, associations are formed both with adjacent and with remote items, was formulated by Ebbinghaus in 1885 and was challenged by the recent experiments of Cason in 1926.

The author has performed further experiments on the same problem and has brought many interesting facts to light. The remote associations appear slightly in immediate learning, but are strongly effective after a period of forgetting. These are determined by (*i*) the degree of learning and by (*ii*) lapse of time. The first factor inhibits their functioning. The stronger the previous learning, the less effective the remote associations. The second factor weakens the first factor of learning and therefore facilitates their working. Thus the results obtained by the author show that the saving

for the immediate relearning is 4·9 p.c., but it rises to 33·4 per cent in relearning after a week. The weaker the original associations become, the stronger the remote associations grow.

Cason's experiments failed to demonstrate this, because he used meaningful words and allowed overlearning which factors allowed the immediate associations to grow stronger thus effectively inhibiting the remote associations.

The course of auditory threshold in the presence of a tonal back ground: *E. G. Wever & S. T. Truman.*

The paper describes experiments conducted to determine quantitatively the interference of auditory back ground in ready hearing. These experiments differ from others of the same nature in the fact that a tonal back ground instead of a noise back ground was used and that the back ground tone is kept constant.

Tuningfork oscillator 1000 cycles sec. was used for the back ground tone and audio-oscillator 2250 cycles sec. for the figural tone. The results obtained showed that the auditory threshold was constant in the case of silence as back ground. But it was much higher in the case of tone as back ground for the first two minutes though afterwards it swept downwards, but it never came to the level of normal threshold.

A further experiment was arranged to determine whether shifting of the ground and figural tone was due to the attentional analysis of auditory complex or to some mechanical factor such as sensory fatigue.

The authors conclude that the lowering of threshold is partly due to the judgment and partly due to some factor that appears to operate automatically. It is suggested that this factor is an enhancement of intensity of the figural tone through attention or else the progressive removal of the masking-effect of ground tone through auditory fatigue.

The relation of physical constitution to general intelligence, social intelligence and emotional instability : H. E. Garret & W. N. Kellog.

The authors performed experiments on 221 College freshmen to determine (1) the relation of physique to general intelligence as a check to the previous work (2) the relation of physique to social intelligence and (3) the relation of physique to emotional instability.

Anthropometric measurements of the subjects were taken to calculate 'morphologic index' as based upon the work of Naccorati. These indices & HT/WT ratio were correlated with the Thorndike Intelligence Examination scores, with the social intelligence scores and with the Woodworth personal data sheet scores. The correlation of morphologic indices and HT/WT ratios with the three scores was small and unreliable showing therefrom that no definite conclusions from the physical constitution can be drawn about the intelligence, social adaptation or the emotional instability.

The secondary results of the experiment are that a correlation of 42 was obtained between the Thorndike Intelligence test and social Intelligence test suggesting that the social Intelligence is to a certain degree a measure of intelligence. The correlation of ·81 between morphologic index and HT/WT ratio show that both the measures are virtually of the same order.

Oral perception in relation to Anosmia : By H. R. Crosland, Ruth C. Miller & Winifred E. Bradway.

The authors conducted experiments on an anosmic person with a view to ascertain as to how far his taste sensitivity has been affected through loss of smell.

It was found that the case was that of complete anosmia. The smelling substances in full strengths with the exception

of peppermint and chloroform (the latter was reported as sweet), caused only kinesthesis, temperature and pressure from the mucous membrane of the nasal cavity, described as burning or fricking; but in dilutions of 1/1500 even these qualities were not experienced.

The taste sensitivity of the anosmic was not impaired. He was slightly inferior to the controls in detecting the salt and slightly superior to them in his sensitivity for sweet. They all possess equal sensitivity for quinine sulphate. The subject could judge like the controls the food substances placed on tongue while blindfolded.

The results in the present case tally with the results of a former experiment conducted on another anosmic person by H. R. Crosland, in 1926.

PARS RAM

July 24, 1928.

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NOTICE

(1) Indian Journal of Psychology is a quarterly publication and is the official organ of the Indian Psychological Association.

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